

## The COVID-19 Isolation Unit Design at Railway-Line Informal Settlement with Participatory Planning Approach

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### ABSTRACT

*The increase in the number of patients who are positive for COVID-19 is not equipped by the capacity of isolation rooms in hospitals and safe houses assigned by the government, only 20% of infected patients require hospital care, while the rest 80% are suggested for self-quarantine and isolation. The problem becoming more complex for dense informal settlements, as a case study is a railway-line settlement in Surabaya. Based on the result of the observation, the house at the railway-line settlement has not met the healthy housing category, if there are residents infected with the COVID-19 virus, self-quarantine in their own house is also inadequate and it can cause the spread of the virus to other family members. This study aims to find a design solution for self-isolation units that can be applied in dense informal settlements during a pandemic. In addition to meeting health requirements, this isolation unit must be easy to assemble, cheap, and fast in its construction. The approach used for its design is participatory planning so that the design results are suitable for community needs and strengthen the community's sense of belonging towards its development and maintenance.*

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Peningkatan jumlah pasien positif COVID-19 tidak dilengkapi dengan kapasitas ruang isolasi di rumah sakit dan rumah aman yang ditetapkan pemerintah. Hanya 20% pasien terinfeksi yang memerlukan perawatan di rumah sakit, sedangkan sisanya 80% disarankan untuk karantina dan isolasi mandiri. Permasalahan menjadi lebih kompleks untuk permukiman informal yang padat, dalam hal ini permukiman di pinggir rel kereta api di Surabaya. Berdasarkan hasil penelitian rumah di permukiman rel kereta api belum memenuhi kategori rumah sehat. Jika ada warga yang terjangkit virus COVID-19, karantina mandiri di rumahnya sendiri juga tidak memadai dan dapat menyebabkan penyebaran virus ke anggota keluarga lainnya. Penelitian ini bertujuan untuk menemukan solusi desain unit isolasi mandiri yang dapat diterapkan di permukiman informal padat pada masa pandemi. Selain memenuhi syarat kesehatan, unit isolasi ini harus mudah dirakit, murah, dan cepat dalam pembangunannya. Pendekatan yang digunakan dalam perancangannya adalah perencanaan partisipatif agar hasil rancangannya sesuai dengan kebutuhan masyarakat dan memperkuat rasa memiliki masyarakat terhadap pengembangan dan pemeliharannya.

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## 1. Introduction

The COVID-19 virus is a contagious virus that changes every aspect of our daily lives, common symptoms of COVID-19 infection include fever, cough and shortness of breath which cause pneumonia, even death. The way to fight this virus is to prevent transmission of the virus through daily hygiene and isolate infected people (World Health Organization, 2020). Based on the existing studies, only 20% of the infected persons need to be treated at the hospital, while 80% are suggested to do self-quarantine and self-isolation at home (Widodo, 2020), this creates a problem in densely informal settlements, where self-isolation is hard to do because of the dense population. Surabaya, as one of the coastal cities with rapid development as an economic center, has attracted many people urbanizing to Surabaya. One of the result is the large number of migrants who start settling and form settlements informally. The COVID-19 pandemic has added a burden on an already vulnerable population, including people living in informal settlements (Cluster, 2020). One of the informal settlement is a railway-line settlement which will be discussed further in this study. The railway-line settlements as the case studies of this research are located in Dupak Magersari - RT 1 / RW 9, Bubutan. The condition of densely populated settlements and unplanned use of space in informal settlements causes a decrease in environmental quality. The development of this area follows the transportation route from the railway-line to Pasar Turi Station (Barbara & Umilia, 2014). The problems of informal settlements are related with urban image and place identity, low environmental quality both physically and socially (Putri & Setyawan, 2016). Poor environmental quality and houses that do not meet healthy criteria can spread the disease due to tight houses, poor ventilation, and unclean environmental conditions. The unhealthy conditions of the house and a dense population condition make it impossible for the residents to do self-isolation inside the house during pandemic. Density is a key factor for COVID-19 transmission. Shelter and settlement interventions can help to reduce the risk by giving the housing options available to those at risk and to reduce the risks posed by the high-density living conditions (UNHCR, 2020). The need of using public spaces as areas for isolation units for residents who have been exposed to the COVID-19 virus become one of the solution to reduce the spreading virus in congested area. It similar to Emergency Quarantine Facilities (EQF), designed by WTA was viable quarantine structure, the Boysen Pavilion as a facility to help COVID-19 patient beside of Manila Hospital that have theme “embodied speed, scalability and simplicity in its structure” (Harrouk, 2020).

This research will discuss the design of the isolation unit for railway-line settlement with participatory planning, the citizen’s input will be relevant data for the design progress. The purpose of participatory planning is for the benefit of the community and to ensure that the solutions match the needs of the community (Abe, 2002). This research needs to be carried out because there is still a lack of research on isolation rooms for residents in dense informal settlements. Many previous studies have discussed infection prevention for COVID-19 patients (World Health Organization, 2020); Smart Isolation Room (Panda et al., 2020); The association of the coronavirus with respiration

(Wu et al., 2020); as well as about the role of the air conditioning system in infection prevention and control (Sundari et al., 2017).



Figure 1. Case studies location

Source: (Arkom, 2020)

## 2. Literature and Method

There is a shift in planning where centralistic control into local management or co-management, the movement shift is meant to increase efficiency, equity, empowerment, and cost-effectiveness. One of these options is also called as community based development (Narayan, 1995). The community-based development approach approach is used to be able to minimize the gap of interests between the community, designers and stakeholders. Even more the community participation support the sustainable planning at local context (Hallstrom et al., 2017; Mistry et al., 2016; Szetey et al., 2021). Successful community-based development must demonstrate a return of control to the community in the research and design process.

Community-based development approaches include various levels and types of community participation (Timothy & White, 1999). Through community based development approach it is expected that the population will have a stronger sense of belonging in its development and maintenance. Arnstein categorizes levels community participation into three stages (Arnstein, 2019) : non-participation, tokenism, and citizen power. Non-participation happens when participation is replaced by an intentional attempt to 'educate' or 'heal' concerns for participants rather than having true involvement. Tokenism enables participants with different degrees of control to influence the final decision, but without the authority to discuss the decision on the design. In the power of citizens, participants have decision-making power, either in part or in whole, through partnerships, delegations, or citizen control. In a typical project, participation can be described through several steps of initiating, planning, designing, implementing and maintaining where each step can be linked to the level of community participation.

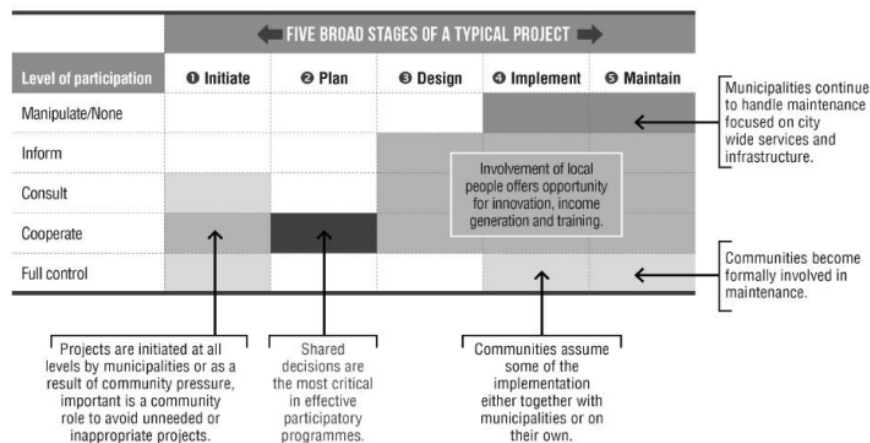


Figure 2. The level and stages of participation

Source :(Programe, 2015)

This research uses qualitative methods with a naturalistic approach. This research includes a variety of context-specific strategies to investigate and answer the research questions (Groat & Wang, 2013). Based on phenomena that occur in their natural environment, empirical evidence is recorded, then synthesized and analyzed into a coherent data set for analysis and conclusion. Ladder of participation describes citizen power as the highest level of participation, in this studies the research's goal is to leverage citizen participation into the level of citizen power- partnership. At the partnership level, there is an agreement between the community and the responsible parties regarding the division of responsibilities in planning, decision making, and solving problems that exist. In this study, the community was involved from the beginning of the decision-making process. By bringing people together and accompanying them to observe their environment in the planning process, the community can increase their ability and knowledge about information and are better able to achieve Citizen Power. Information from the community during the analysis stage is compiled in a comprehensive manner, resulting in a holistic document containing all the information needed to plan the next steps in the design process using participatory methods, there are: initiation stage, planning stage, design stage, implementation stage and maintain stage. Data collecting done through surveys, interviews and observations. The data obtained is then interpreted through a group discussion forum (FGD) to identify potential and existing problems. In this way, the issues and goals in the community can be determined as the basis for further planning processes. The results are digitized and structured into a comprehensive document that can be used for further processing.

### 3. Results and Discussion

In the design process of the isolation unit, the data collecting phase was carried out with the ARKOM Jatim team to determine the existing condition, the identification was carried out by field surveys, discussions with railway-line settlement inhabitants. The

mapping process is not just about gathering information and data and compiling data just to let people know. It also provides opportunities for communities to form working groups that can help find priorities in the community (Luansang et al., 2012). According to the participatory planning stages, the design stages in the isolation unit design can be described as follows:

1. *Initiation stage where both ARKOM East Java and the community are involved in the process.*

The result of the initiation process is the existing physical and non-physical data that can be summarized in finding of the house typology (Figure 3).



Figure 3. House typology in railway settlement

Source: (Arkorn, 2020)

From Figure 3 it can be seen that only 9% of the total houses in the settlements were categorized as healthy houses in railroad settlements, while 69% of the houses did not meet the standard space per person and did not meet the criteria for space per person and healthy houses. Related to the condition of the houses that are close together, the lack of natural ventilation and lighting inside the house, the houses that not meet the healthy house criteria. The railway-line settlement was chosen as the object of the study because this area was rarely touched by the government because the majority of its residents did not yet have an identity as residents of the City of Surabaya, in other words, the residents were dominated by immigrants. From the initial observation process with ARKOM JATIM, it can be seen that of the 166 houses that were sampled in the railway-line settlement, 114 of them were included in type 4, namely houses with room standards per person and aspects of a healthy house were not met, and only 15 houses that meet the healthy house criteria.

2. *Planning stage where both ARKOM East Java and the community are involved in the process.*

After knowing the physical condition of the residents' houses in the railway settlement, the next step is to hold focus group discussions especially with families who have positive members and community cadres as the COVID-19 village task force. The result of the discussion was to determine the right location for the construction of the isolation unit, from the Dupak Margersari village agreed to use the public space owned by the community at the front of the settlement.

From the discussion with the community cadres, on determining the location of the isolation unit, and data analysis regarding the physical and non-physical conditions of the railway-line settlement, several design parameters were obtained, that can be explained as follows:

- The design of the isolation unit in railway-line settlement area located in a densely populated area, so that the size of the unit cannot be too big.
- The isolation unit must accommodate several people to do self-quarantine.
- The unit must have good air circulation.
- The unit must have easy access to both family and relatives without compromising standard health protocols.
- Easy to assemble, common material, lightweight and durable.

3. *Design stage where both ARKOM East Java and the community are involved in the process.*

From the design parameters of the isolation unit that have been mentioned, then the design of the isolation unit is proposed, which after being designed is discussed again with the railway-line settlement community. The requirements for designing an isolation unit refers to a case study from the Refugee Housing Unit which is used as isolation accommodation (UNHCR, 2020), that can be explained as follows:

- Quick and simple to construct, particularly in countries with prior implementation experience
- Easy to disinfection
- Adaptable to changing conditions by being movable, modular, and reusable.
- Appropriate for use by stakeholders and local governments
- Effective in decongesting high-risk environments, such as a transit center, where separation or family/individual solutions are a priority.

In the design of the isolation unit, the components of the isolation unit use a knock-down structure system with a building frame made of double canal C. The isolation unit design in size 3x3 meter squares modules to accommodate 2 people. The roof of the insulation unit uses a spandex roof, the wall panels use an iron frame with semi-transparent polycarbonate material and the floor uses a multiplex. The choice of semi-transparent polycarbonate material as a wall panel to maximize natural lighting from the daylight, and also intended to give

a broad impression of the space but still provide privacy for the user. The need for natural light in space is not only important to observe the surrounding environment but also as a supply of vitamin D which is important for human metabolism (Salingaros, 2015). The selection of this semi-transparent polycarbonate material also considers the ease of routine disinfection, especially on the surface of the surrounding space and high contact areas (Tang et al., 2020). The isolation unit is also designed with gaps between roof structures to provide better thermal protection from outdoor temperatures and provide space for outdoor air introduction (Afif et al., 2019). The need for good air circulation is needed because COVID-19 transmission will increase when buildings have poor ventilation in closed spaces (Sloan Brittain et al., 2020). Effective ventilation is essential to eliminate airborne viruses (Cook, 2020).

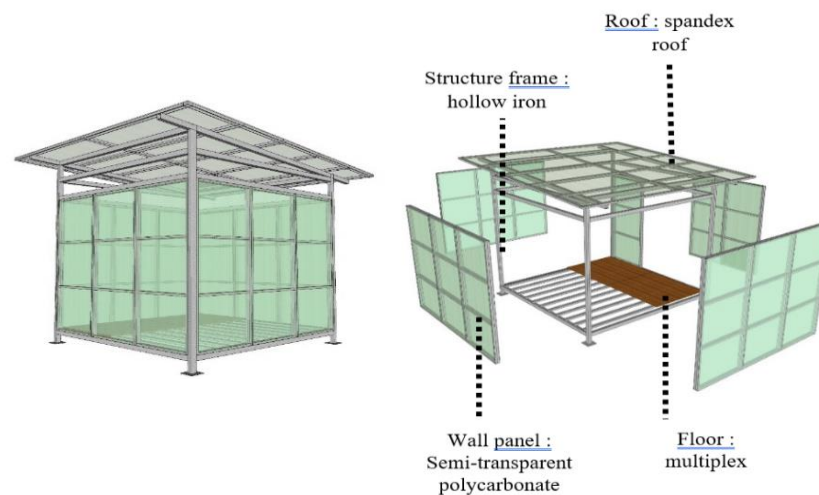


Figure 4. The Isolation Unit and material details

Source: personal documentation, 2021

#### 4. Implementation stage where both ARKOM East Java and the community are involved in the process.

The design of the isolation unit that had been discussed with the railway-line resident then being constructed with the residents and supervised by the research team as facilitators. The knocked-down structure system makes it approximately 6 hours for construction. Several steps to construct the isolation unit with the community participatory can be explained as follows: installation of floor structure, support column, roof frames, floor covering materials (multiplex), roof covering material (spandex roof) and wall covering panels (semi-transparent polycarbonate panels).

The construction process with the community is expected to create a sense of belonging to the community and provide knowledge in dismantling the isolation units so that if it is necessary to move to another area, the community can do it themselves. In the process of isolation unit construction, residents of a railway-

line settlement also equip the isolation unit with a handwashing area near the isolation unit as a health protocol requirement, this goes along with common health protocols are isolation, quarantine, social distancing, and hand hygiene practices (Kumar & Morawska, 2019). The existence of a hand washing area near the isolation unit is important concerning hand hygiene protocols, where the intensity of handwashing will be increased. (Panda et al., 2020).



Figure 5. Floor, column and roof structure frames installation

Source: (Personal documentation, 2021)



Figure 6. Floor, roof and wall covering installation

Source: (Personal documentation, 2021)

#### 5. *Maintain stage where the isolation unit are handed over the community*

After the isolation unit was built by ARKOM East Java and the community, then the unit was taken over by the community as an isolation unit for their infected community.

#### 4. Conclusion

Participation in community-based development (CBD) depends on handing over control to the community. Success design in community-based development (CBD) needs to consider local needs, understanding the development potential of the existing community, and able to properly define what changes are needed in the community. The development of isolation units in railway-line settlement applies a degree of community power-partnership where the community is involved from decision-making to construction of the isolation unit. By involving the community in the development process, it is expected to create a sense of belonging for the community. Considering that this portable isolation unit is also a health facility in a small unit, it needs to be accompanied by other procedures such as health protocols and clinical cleaning



procedures. there is still room for improvement in the design of portable isolation units as modules for other emergencies needed in the future that requires fast time to build and install.

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